

## REMARKS

Favorable reconsideration of this application, in light of the following discussion and in view of the present amendment, is respectfully requested.

Claims 1, 7, 16 and 19 are amended. Claims 1-12, 14-17, 19 and 20 are pending.

### Entry of Amendment under 37 C.F.R. § 1.116

The Applicant requests entry of this Rule 116 Response because: the amendments were not earlier presented because the Applicant believed in good faith that the cited references did not disclose the present invention as previously claimed; and the amendment does not significantly alter the scope of the claim and places the application at least into a better form for purposes of appeal.

The Manual of Patent Examining Procedures (M.P.E.P.) sets forth in Section 714.12 that “any amendment that would place the case either in condition for allowance or in better form for appeal may be entered.” Moreover, Section 714.13 sets forth that “the Proposed Amendment should be given sufficient consideration to determine whether the claims are in condition for allowance and/or whether the issues on appeal are simplified.” The M.P.E.P. further articulates that the reason for any non-entry should be explained expressly in the Advisory Action.

#### **I. Claim Objections**

In the Office Action, at page 2, claims 16 and 19 were objected to as being of improper dependent form. Claims 16 and 19 were amended in light of the Examiner's comments, and accordingly, withdrawal of the objection to the claims is respectfully requested.

#### **II. Rejection under 35 U.S.C. § 102**

In the Office Action, at page 2, claims 1 and 10 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,402,053 to Kelley et al. This rejection is respectfully traversed because Kelley does not discuss or suggest:

wherein said hand has orientation changing means for changing orientation of said holding means and is capable of selectively taking one of a plurality of orientations including a first orientation and a second orientation different from each other with respect to said robot arm in accordance with a command from said controller, said controller issuing the command to said hand prior to holding of the object in accordance with a status of the object to be taken out detected by said detecting means to selectively take one of the

plurality of orientations of the holding means including the first orientation and the second orientation prior to the holding of the object,

as recited in amended independent claim 1.

Kelley discusses a robot assembly 20 including an arm 22, a hand 26 (shown in Fig. 2 as element 16), and a wrist 24. A vacuum cup 28 is attached to the hand 26. The wrist 24 is rotatable about rotary axis  $\theta 4$  and rotary axis  $\theta 5$ . Kelley discusses that during a first segment of instruction, five poses are specified, including presentation poses in which the workpiece is presented to the workstation camera, a bin view pose, a descent pose and a supply bin drop-off pose. Upon workpiece acquisition, the robot assembly moves to the bin view pose and a binary image is formed using an arm camera 42. Following visual analysis, the assembly 20 moves to the descent pose over the selected site, the hand 26 is unlocked and descends vertically until either contact with a workpiece is sensed or until the bin floor is reached, and if contact is sensed, the vacuum is turned on and the hand continues to descend slowly until either grasping is sensed or until the hand is moved downwardly a fixed distance. **Following successful acquisition of a workpiece from the bin**, workpiece orientation in the robot hand is found. Images are formed using the workstation camera 44 and image features are extracted so that the relationship of the actual workpiece coordinate system to the stored model coordinate system is found.

In Kelley, while cameras are used to view the workpiece being removed and are used to determine the position and orientation of the workpiece, Kelley does not suggest that a controller issues a command to the hand 26 **prior to holding of the object** in accordance with a status of the object to be taken out detected by a detecting means to selectively change the orientation of a holding means **prior to the holding of the object**. Kelley discusses that, while the bin is viewed prior to causing the hand 26 to descend vertically to grasp a workpiece and then, **after the workpiece has been grasped**, the hand 26 is moved to another position to allow the camera 44 to obtain an image of the workpiece in order to determine the position and orientation of the workpiece, the hand 26 being moved between a first position and a second position only after the workpiece has already been grasped. Kelley does not suggest that a controller issues a command for the hand to selectively take one of a plurality of orientations prior to holding the workpiece.

Further, the Examiner alleges that the detecting means corresponds with the imaging system of Kelley, the status of the object to be taken out corresponds with the potential surfaces on the workpiece, and when the controller issues a command to the hand prior to holding an

object corresponds to when the hand moves into contacting engagement with a holdsite. Amended independent claim 1 recites that the hand has "orientation changing means for changing orientation of said holding means and is capable of selectively taking one of a plurality of orientations including a first orientation and a second orientation different from each other with respect to said robot arm in accordance with a command from said controller, said controller issuing the command to said hand prior to holding of the object in accordance with a status of the object to be taken out detected by said detecting means to selectively take one of the plurality of orientations of the holding means including the first orientation and the second orientation prior to the holding of the object."

While the hand 26 in Kelley is able to approach the bin to grasp a workpiece after the camera 42 takes an image of the bin, Kelley does not suggest that the hand 26 selectively takes one of a plurality of orientations including a first and second orientation prior to holding of the object in accordance with a status of the object detected by the detecting means. The camera 42 takes an image of the bin prior to holding the object. The camera 44 takes an image of the object after the vacuum 28 of the hand 26 has grasped the object. However, the hand 26 in Kelley is not capable of selectively taking one of a plurality of orientations prior to holding the workpiece, the orientation being taken based on a command issued in accordance with a status of the object to be taken out detected by a detecting means.

The hand 26 in Kelley is able to be positioned in a first, vertical position and the hand is able to grasp a workpiece by vertically descending. However, nowhere in Kelley is there discussion of the hand 26 having an orientation changing means that changes the orientation of the vacuum cup 28 upon a command issued by a controller prior to holding of the object in accordance with a status of the object to be taken out which is detected. Kelley does not suggest that the image of the workpiece bin that is taken prior to causing the hand 26 to vertically descend is used to make a determination as to which of two orientations the hand 26 should take prior to descending into the bin to obtain the workpiece. Kelley discusses that the hand 26 is caused to vertically descend, but not that the hand 26 is moved to a second orientation before descent, particularly based on a status of the workpiece detected by a detecting means. The camera 42 in Kelley only selects a holdsite on the workpiece such that the hand 26 is caused to vertically descend in one orientation to the workpiece.

Further, the present invention of claim 1, for example, particularly recites that the holding means selectively takes one of a plurality of orientations including a first orientation and a second orientation. Kelley does not suggest that, in accordance with a command issued from a

controller prior to holding of an object, orientation changing means changes the orientation of the vacuum cup 28 so that the vacuum cup 28 selectively takes one of plural orientations. Kelley particularly discusses that the vacuum cup 28 extends downward in a locked, vertical position and does not suggest that the vacuum cup 28 is moved to a second orientation in accordance with a status of the object to be taken out prior to holding the object.

Also, Kelley discusses only that the orientation of the hand 26 is changed by movement of the wrist 24 so that the camera 44 is able to obtain an image of the workpiece that is currently grasped by the vacuum cup 28 in order to determine the pose and orientation of the grasped workpiece. Kelley does not discuss changing the orientation of the hand 26 to a second orientation before grasping the workpiece and after receiving a command issued in accordance with a detected status of the workpiece.

Therefore, as Kelley does not discuss or suggest that "said hand has orientation changing means for changing orientation of said holding means and is capable of selectively taking one of a plurality of orientations including a first orientation and a second orientation different from each other with respect to said robot arm in accordance with a command from said controller, said controller issuing the command to said hand prior to holding of the object in accordance with a status of the object to be taken out detected by said detecting means to selectively take one of the plurality of orientations of the holding means including the first orientation and the second orientation prior to the holding of the object," as recited in amended independent claim 1, claim 1 patentably distinguishes over the reference relied upon. Accordingly, withdrawal of the § 102(b) rejection is respectfully requested.

Further, Kelley does not discuss or suggest "orientation changing means provided at said hand, for changing orientation of said holding means to selectively take one of a plurality of orientations including a first orientation and a second orientation different from each another; and a visual sensor for detecting a condition of placement of an object, wherein said orientation changing means changes the orientation of said holding means according to the detected condition before holding the object (emphasis added)," as recited in independent claim 10.

In addition, Kelley does not discuss or suggest "a hand attached to a distal end of the robot arm and having holding means for holding an object, a center of holding by said holding means being offset from a center axis of a proximal portion thereof," as also recited in independent claim 10. The Examiner alleges that Kelley discusses that a center of holding by the holding means is offset from an axis of a proximal portion thereof and refers to col. 5, lines 36-38 of Kelley which recites that "[t]he hand (vacuum cup) is displaced from 05 axis by a fixed

distance denoted by the parameter value  $h$ ". The Applicants respectfully disagree with the Examiner's interpretation.

As shown in Fig. 3, the hand 26 is displaced from the  $\theta 5$  axis, about which the wrist 24 is able to be rotated, by the value " $h$ ". Thus, the value " $h$ " indicates only the distance between the horizontal axis of the wrist 24 and the vacuum cup 28. In Kelley, a center of holding of the alleged holding means (the vacuum cup 28) is not offset from a center axis of a proximal portion thereof (i.e., of the vacuum cup itself). Further, the center of holding of the vacuum cup 28 is not even offset from a center axis of a proximal portion of the hand 26. Fig. 3 illustrates only the relationship between a base coordinate system of the robot assembly and a hand coordinate system in terms of an arm joint coordinate system, but does not suggest that a center of holding of the vacuum cup 28 is offset from a center axis of a proximal portion of the vacuum cup 28 or the hand 26.

In contrast, Fig. 2a and 2b of the present application clearly show that holding center C of the holding means 35 of the hand 3 is offset from a center axis D of a proximal portion of the hand 3. Kelley does not suggest such a configuration. In particular, referring to Fig. 2, Kelley clearly shows that the center of holding of the vacuum cup 28 is the exact same as the center axis of the proximal portion of the vacuum cup 28. Thus, as the center of holding and the center axis are the same, the center axis of the proximal portion of the vacuum cup 28 cannot be offset from the center of holding of the vacuum cup 28. Further, even taking into consideration Fig. 7, for example, in which the vacuum cup 104 is positioned perpendicular to the hand to which the cup 104 is attached, Kelley does not suggest that the center of holding of the vacuum cup 104 is offset from the center axis of the proximal portion of the vacuum cup 104. The vacuum cup 104 is merely perpendicularly aligned with the end portion of the hand.

Therefore, as Kelley does not discuss or suggest that "a center of holding by said holding means being offset from a center axis of a proximal portion thereof," as recited in independent claim 10, claim 10 patentably distinguishes over the reference relied upon. Accordingly, withdrawal of the § 102(b) rejection is respectfully requested.

### **III. Rejection under 35 U.S.C. § 103**

In the Office Action, at page 3, claims 2-5, 10-12, 17 and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kelley. This rejection is respectfully traversed.

As discussed above, Kelley does not discuss or suggest all the features of independent claims 1 and 10. Further, Kelley does not discuss or suggest "a visual sensor for detecting condition of overlapping of objects, wherein a holding position of the object by said holding

means is changed according to the detected condition, and wherein a center of holding by said holding means is offset from a center axis of a proximal portion thereof and a predetermined angle not equal to zero degrees is formed between a direction of a holding axis of said holding means and a rotational axis of the distal end of the robot arm,” as recited in independent claim 17. Kelley does not suggest that a holding position of a workpiece is changed according to a detected condition of overlapping of objects, particularly as Kelley only discusses that the hand 26 vertically descends to grasp a holdsite of a workpiece, but does not suggest that a holding position of an object is changed according to a detected condition of overlapping objects. Therefore, claim 17 patentably distinguishes over the reference relied upon. Accordingly, withdrawal of the § 103(a) rejection is respectfully requested.

Claims 2-5, 10-12 and 20 depend either directly or indirectly from independent claims 1, 10 and 17 and include all the features of their respective independent claims, plus additional features that are not discussed or suggested by the reference relied upon. For example, claim 2 recites that “the first orientation is set such that a direction of a holding axis of said holding means is closest to a direction of a rotational axis of the distal end of the robot arm in the plurality of orientations to form a predetermined angle not equal to zero degree between the direction of the holding axis and the direction of the rotational axis of the distal end of the robot arm.” Therefore, claims 2-5, 10-12 and 20 patentably distinguish over the references relied upon for at least the reasons discussed above. Accordingly, withdrawal of the § 103(a) rejection is respectfully requested.

In the Office Action, at pages 4 and 5, claims 6-9, 14-16 and 19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kelley in view of U.S. Patent No. 6,597,971 to Kanno or U.S. Patent No. 4,613,269 to Wilder et al. These rejections are respectfully traversed.

As discussed above, Kelley does not discuss or suggest all the features of independent claims 1, 10 and 17. Kanno and Wilder fail to make up for the deficiencies in Kelley, specifically as to a controller issuing a command to a hand prior to holding of an object in accordance with a status of the object to be taken out detected by detecting means, thereby selectively changing the orientation of holding means prior to the holding of the object. Accordingly, claims 1 and 10 patentably distinguish over the references relied upon.

Claims 6-9, 14-16 and 19 depend either directly or indirectly from independent claims 1, 10 and 17 and include all the features of their respective independent claims, plus additional features that are not discussed or suggested by the reference relied upon. For example, claim 6 recites “a visual sensor for detecting a condition of placement of an object, wherein said

orientation changing means changes the orientation of said holding means according to the detected condition before holding the object." Therefore, claims 6-9, 14-16 and 19 patentably distinguish over the references relied upon for at least the reasons discussed above. Accordingly, withdrawal of the §103(a) rejection is respectfully requested.

### Conclusion

In accordance with the foregoing, claims 1, 7, 16 and 19 have been amended. Claims 1-12, 14-17, 19 and 20 are pending and under consideration.

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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